DOCUMENT RESUME

ED 250 583 CG 017 782

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TITLE Alcoholism, Field Dependency and Organic Impairment.
PUB DATE Aug 84
NOTE 17p.; Paper presented at the Annual Convention of the American Psychological Association (92nd, Toronto, Ontario, Canada, August 24-28, 1984).
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Adults; *Alcoholism; *Field Dependence Independence; Males; *Neurological Impairments; Reaction Time

ABSTRACT

Although research has suggested that field dependency is a relatively stable characteristic of alcoholics, the results have been confounded by the use of different measures and different time intervals. To investigate the degree of organic brain impairment and its association with measured field dependency amongst alcoholics, 41 male alcoholics, in a 10-month treatment program, completed the Witkin Embedded Figures (forms A and B), the Trail Making Test B, and the Tactile Performance Test (TPT). One half of the subjects were post-tested at 3 weeks and the other subjects were post-tested at 5 weeks on the same measures. An analysis of the results showed no significant initial differences between the two groups on field dependency, cognitive impairment, or time, memory, and location scores on the TPT. Both groups were normatively high in field dependency and mildly neurologically impaired. However, significant decreases in field dependency were found by 3 weeks in treatment, with a subsequent leveling off. All the organic test measures except the TPT showed significant improvement for the 5-week group, while only the TPT improved for the 3-week group. All measures of cognitive functioning at post-test showed significant improvement. These findings suggest that the field dependency of alcoholics may be in large measure an effect of alcohol rather than a cause. (BL)

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ED250583

# Alcoholism, Field Dependency and Organic Impairment

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Running head: ALCOHOLISM

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Abstract

Field dependency and organic impairment were measured at the start of treatment for alcoholism, and at intervals during treatment. Contrary to much of the literature, significant decreases in field dependency were found by three weeks in treatment with a leveling off from there on. Perceptual and tactile response time were the major factors in the impaired, independence of field and cognitive functioning. These data suggest that the widely noted field dependency of alcoholics may in large measure be an effect of alcohol rather than a cause.

Alcoholism, Field Dependency and Organic Impairment

Since Witkin et al.'s (1959) initial report that alcoholics as a group are more field dependent than non alcoholic controls many subsequent studies have supported that position (Karp et al., 1965a; Karp et al., 1965b; Karp & Konstadt, 1965; Jacobson et al., 1970; McWilliams et al., 1975). Further these studies suggest that field dependence is a relatively stable characteristic of the alcoholic. However, there are several data based reports which challenge the consistency of field dependence, by virtue of some findings that field dependency declines over time in treatment for alcoholism (Kristofferson, 1968; Chess, 1969; Goldstein & Chatlas, 1965). Difficulties in comparing these studies has come from the use of different measures of field dependence and different pre-post time intervals.

Danahy and Kahn (1981) using the Embedded Figures measure over a pre-post test period of a 60 day treatment program found large significant mean decline in field dependence and suggested that it might be accounted for largely by factors of improved brain and physical functioning following abstainance and treatment.

The present study sought to cross validate that finding of reduce field dependence in alcoholics from the same program several years later and to investigate the degree of orgaric brain impairment and its association with measured field dependency

change during the treatment program.

## Method

All patients who entered a VA inpatient 60 day alcohol treatment program over a 10 month period were asked to volunteer to take pre and post tests of field dependency and organicity. The 41 males who volunteered had a mean age of 40.86, a mean period of drinking of 15.3 years. Socio-economically they were lower middle class. The average educational level was 10.4 years.

All were pre and posttested on the Witkin Embedded figures (form A and B) as a measure of field dependency, the Trail Making Test B and the tactile performance test as brief tests of organicity. Subjects were divided randomly into two groups, one of which was post tested at the end of 3 weeks in treatment and the other at the end of 5 weeks. The alternate form of embedded figures was used and the neuropsychology measures were repeated. A brief interview also was conducted initially to obtain demographic data and drinking history.

## Results

As indicated by Table 1, t-test comparisons found no significant initial difference between the two groups on field dependence, as measured by the EFT, or on cognitive impairment, as measured by the Trails B component of the Trail Making Test, and the total time, memory, and location scores of the Tactual Performance Test (TPT) at pre-testing. Also, there were no

significant differences between the groups on age of subjects or length of drinking history, as measured by self-report. Both groups were normatively high on field dependence and both groups obtained mean scores on Trails B, TPT total time and TPT location, during pre-testing, that would be classified as mildly impaired performances by the Russell, Newringer, and Goldstein (1970) rating system. The mean TPT memory scores of both groups at pre-testing would be classified as within normal limits by Russell et al. (1970).

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Insert Table 1 about here

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As indicated by Table 2, a significant and substantial decrease in field dependence (EFT) was found by t test for each group at post-testing. An analysis of variance revealed no significant between group difference in the amount of change on the EFT, indicating that the decrease in field dependence appears to occur within the first three weeks of treatment and to remain stable within the fourth and fifth weeks.

As indicated in Table 2, all of the organic test measures but the TPT location showed significant improvement for the 5 week groups while only the TPT memory did so the 3 week group as well. However, these tests were only completed by about half the total population since it was made optional. The small sample size is

thus a factor.

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Insert Table 2 about here

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As indicatd by Table 3, significant improvement was found on all the measures of cognitive functioning at post-testing, when all the subjects who completed post-testing were included in the t-test comparison, without making a group distinction. Ignoring the group distinction for this analysis appeared to be plausible because comparison of pre-test means did not find significant differences between the groups, nor did analyses of variance find significant between group differences in the amount of change on these measures. Providing a larger number of cases to analyze resulted in the finding of statistically significant change toward improved performance on these measures.

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Insert Table 3 about here

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Pearson product-moment correlations were computed between EFT performance during pre-testing and performance on each of the cognitive measures during pre-testing, for all subjects (N = 41). The largest correlation was obtained pre-EFT scores and pre-TPT time scores ($r$ = .7009, $p$ = .001), suggesting that the 49% of variance accounted for by these two measures, could be due to the

fact that both are based on time scores. however, lower but significant pretest correlations between EFT performance and performance on Trails B also emerged ($r$ = .5434, $p$= .000), as did a significant correlation between pre-EFT and pre-TPT memory scores ($r$ = .4733, $p$ =.001), and a significant correlation between pre-EFT and pre-TPT location scores ($r$ = -.3785, $p$ = .007). Each of these correlations reveals an association between a presumed field dependence measure and a measure of cognitive impairment where time is not a variable in common. The variance shared with EFT is substantially less for the non-timed cognitive tests than for the timed one.

A multiple step-wise regression analysis was done to determine the association between field dependency and the neuropsychological measures (Trial B, and components of the Tactical Performance). A substantial and significant positive correlation ($r$ = .70088, $p$ < .001) between EFT score and the time to complete the TPT, accounting for .49% of the variance was found. The addition of the remaining tactical performance variables did not appreciably increase the correlation (.74255).

A multiple step-wise regression analysis was also done between subject age and length of drinking history. A significant positive correlation ($r$ = .41128) $p$ < .008 between EFT score and age emerged. When length of drinking was included the correlation was increased to .52982, $p$ < .002.

## Discussion

These results support those findings on field dependency which indicate that field in dependence is impaired in association with acute alcohol state and substantially improves with treatment for the alcoholism condition. The improvement toward field independence is substantial and appears from this data to occur within three weeks of treatment and to stabilize from that point or earlier. Since the pre and post EFT means from this study are very close to those found by Danaby and Kahn (1981) where the post testing was at 9 weeks the case for a rapid gain in field independence within three to five weeks and a stability of the level thereafter is supported.

Danahy and Kahn (1981) pointed out that the EFT measure of field dependence is based on perceptual reaction time which very likely is impaired as the result of alcohol effects on the brain and nervous system as well as generally impaired physical condition of most alcoholics. That the tactile performance time measure was significantly associated with the EFT further supports this interpretation. That the other measure of neuropsychological function do not improve the correlation suggest that they may represent a different dimension than that measured by the EFT. While the EFT shares varying percentages of variance with measures of cognitive impairment, particularly timed measures, most of the variance is not accounted for by that factor.

A relationship between EFT performance and performance on these neuropsychological measures is not surprising because of the similar abilities which are required by the EFT and these other measures. Both EFT and the timed component of the TPT are speed-dependent tasks of visuospatial organization, while the EFT shares a speed-dependent visual scanning component with Trails B and a memory component with TPT memory and location indices. These results suggest that field dependence, as measured by the EFT, is confounded by the EFT's sensitivity to cognitive dysfunction in an alcoholic problem.

Field dependency of alcoholics thus appears to be related to cognitive speed impairment, and shows dramatic recovery within weeks after cessation of drinking and the start of treatment. It appears to follow a course very similar to that of the cognitive impairment of alcoholics recently reviewed by Goldman (1983).

These results suggest that while field dependency may be a cognitive style of some stability, as measured by the EFT, it is vulnerable to the effects of alcohol on the brain. Theories which postulate field dependency as a major factor in predisposing cause of alcoholism may have been based on an effect of alcohol rather than on a cause.

While there appears to be a significant cognitive impairment component in the EFT, the EFT also has significant shared variance with other measures of field dependence (RF).

The relationship of measured field dependence and neuropsychological impairment in general is a question raised by this study for further research.

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TABLE 1

Comparison of pre-test means on all measures

| | Number of Cases | Pre-Mean | t | P |
|---|---|---|---|---|
| EFT | | | | |
| Group 1 | 20 | 91.51 | .80 | .430 |
| Group 2 | 21 | 80.80 | | |
| Trails B | | | | |
| Group 1 | 20 | 99.10 | -.70 | .490 |
| Group 2 | 21 | 114.90 | | |
| TPT TIME | | | | |
| Group 1 | 20 | 1052.3500(seconds) | .32 | .749 |
| Group 2 | 21 | 983.2381(seconds) | | |
| TPT MEMORY | | | | |
| Group 1 | 20 | 6.05 | -1.85 | .073 |
| Group 2 | 21 | 6.90 | | |
| TPT LOCATION | | | | |
| Group 1 | 20 | 3.00 | -1.03 | .311 |
| Group 2 | 21 | 3.71 | | |
| Subject Age | | | | |
| Group 1 | 20 | 39.00 | - .83 | .412 |
| Group 2 | 21 | 42.23 | | |
| Length of Drinking History (self-report) | | | | |
| Group 1 | 20 | 16.70 | .76 | .451 |
| Group 2 | 21 | 14.04 | | |

TABLE 2

Comparison of pre-test with post-test means on all measures

| | Number of Cases | Pre-Mean | Post-Mean | t | P |
|---|---|---|---|---|---|
| EFT | | | | | |
| Group 1 (post-test at 3 weeks of treatment) | 20 | 91.5190 | 68.3110 | 4.10 | .000* |
| Group 2 (post-test at 5 weeks of treatment) | 21 | 80.8610 | 57.2524 | 4.72 | .000* |
| Trails B | | | | | |
| Group 1 | 11 | 87.3636 | 63.612 | 1.53 | .0785 |
| Group 2 | 13 | 84.9231 | 59.000 | 1.93 | .035* |
| TPT Time | | | | | |
| Group 1 | 11 | 882.1818(sec.) | 770.2727(sec.) | 1.48 | .08 |
| Group 2 | 14 | 766.1429(sec.) | 654.5714(sec.) | 2.63 | .010* |
| TPT Memory | | | | | |
| Group 1 | 11 | 6.2727 | 7.1818 | -2.65 | .012* |
| Group 2 | 14 | 7.3571 | 8.3571 | -2.55 | .012* |
| TPT Location | | | | | |
| Group 1 | 11 | 3.1818 | 3.9091 | -1.34 | 1.04 |
| Group 2 | 14 | 4.6429 | 5.4286 | -1.08 | .6 |

(* indicates significance at $< .05$)

TABLE 3

Comparison of pre-test with post-test means on all measures for all subjects

| | Number of Case | Pre-Mean | Post-Mean | t | P |
|---|---|---|---|---|---|
| EFT | 41 | 86.0293 | 62.8907 | 6.30 | .000* |
| TRAILS B | 24 | 86.0417 | 62.2500 | 2.52 | .009* |
| TPT TIME | 25 | 817.2000(seconds) | 705.4800(seconds) | 2.79 | .005* |
| TPT MEMORY | 25 | 6.8800 | 7.8400 | -3.67 | .000* |
| TPT LOCATION | 25 | 4.000 | 4.7600 | -1.64 | .057* |

(* indicates significance at $\leq .05$)